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CALIFORNIA STATE BOARD OF FORESTRY

Forestry

CIRCULAR No. 7

7-1920

Grain, Pasture and Hay Fires in California

1919



A grain field that was protected by the burning of dry grass along the highway, and the plowing of furrows inside the field.

CALIFORNIA STATE PRINTING OFFICE
SACRAMENTO
1920

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January, 1920.

GRAIN, PASTURE AND HAY FIRES IN CALIFORNIA, 1919.

The destruction by fire of grain, hay and pasture in the valleys of California during the season of 1919 exceeds that of any year for which records are available. The high loss was largely due to the following reasons:

1. Failure to clear roadsides of inflammable material.
2. Lack of precaution in safeguarding grain and hay fields by plowing furrows and cutting hay strips.
3. Careless burning of grass and stubble.
4. Carelessness with matches and burning tobacco, particularly on the part of the traveling public.
5. Failure to safeguard tractors and trucks with safe spark-arresters.
6. Strong winds from thirty to thirty-five miles per hour that fanned any spark of fire dropped in grain fields or on adjoining roads.
7. Lack of organization and proper fire fighting equipment.

Admitted that fire conditions during the season of 1919 were particularly hazardous, yet the fact remains that there is much to be done in the way of rural fire protection in California before the quarter of a million dollar average annual loss of grain and hay is materially reduced.

The efforts made by the four hundred or more rural fire companies in the state deserve the highest praise. The organizations in some counties have materially reduced the losses from last year, but in other sections there was a let-down in community effort. During the war everyone realized the importance of saving crops from destruction, and every available agency was called into action to safeguard them from hazards, one of the chief of which was fire.

The grain and hay produced in California is now needed as badly by humanity as it was during the war, and will be for years to come. Its destruction by fire constitutes an economic waste. The people of the state should bend every effort the coming season to prevent and suppress the fires that are causing such a great loss of food products in California. The following newspaper extracts will give an idea of some of the losses sustained last summer:

PETERS, July 9. In one of the most disastrous fires in many seasons over eight hundred acres of fine wheat and barley, 500 sacks of barley, a number of farm buildings, large quantities of hay and seed barley, portions of telephone lines and fences were destroyed in this neighborhood yesterday, and only the desperate courage of fully 150 fire fighters prevented several thousand acres from being swept. * * * The origin of the fire is wrapped in mystery. Opinions differ. Some think a match tossed aside by a careless sack-buck caused it, while others are inclined to the belief that a spark from a caterpillar on a nearby ranch started the fire.

DINUBA, June 24. What was perhaps the most destructive grain fire that has ever visited this region occurred Sunday afternoon in Hills Valley. Over three

hundred acres of barley and wheat, belonging to Long and Sullivan, were destroyed, together with a harvester belonging to Mr. Hackett.

The fire was undoubtedly caused by a lighted cigar being thrown by the wayside. It lighted the dry grass and the fire soon spread to the grain. The fire traveled so fast that a man on horseback could not keep up with it in trying to fight it.

TURLOCK, June 19. One hundred acres of wheat and fifty acres of barley were destroyed by a fire that swept across the ranches of George A. Leclert, N. J. Reed and Wallace, six miles northeast of Waterford, Monday afternoon. The fire originated from ashes dropped in the field by employees on the Leclert ranch and spread to adjoining fields before it could be brought under control.

HOW TO PREVENT GRAIN FIELD FIRES.

Burn inflammable material along roads adjoining grain fields.

Eight fires were set on a windy day in June along a highway in Solano County, by burning tobacco tossed from passing automobiles. "Tailor-made" cigarettes hold their fire and even when dropped on the roadbed, are easily blown into adjoining dry grass. Grain and fences will continue to be burned by fires set by a thoughtless traveling public as long as tinder-like vegetation is allowed to accumulate along the roads.

Ranchers can easily eliminate this fire hazard by burning the dry grass along the roads adjoining their property. Burning should be done in the evening or early morning. It should be done slowly with plenty of sacks and fire extinguishers on hand to prevent the fire from getting beyond control.

A number of counties require permits for burning from the county firewarden or a state firewarden in the district where the burning is to be done since it was found that many fires set to clear land of brush, stubble or grass were not properly safeguarded and damaged neighboring property. As a result of the permit system in effect in these counties a considerable saving of property has been made since very few fires escaped beyond control where permits were issued. The following form of county ordinance governing the issuance of burning permits is suggested:

An ordinance to protect life and property from danger of fire, requiring permits to set fires in certain cases and prescribing penalties for violation of the provisions hereof.

The board of supervisors of the county of-----do enact as follows:

SECTION 1. In this county between the first day of June and the first day of December in any year it shall be unlawful for any person on his own land or on that of another to use fire for cleaning land or to burn brush, slash, grass, stubble or other inflammable material without written permission from the county firewarden or from a state firewarden residing within the county, and compliance with the terms thereof; *provided, however,* a permit shall not be necessary to burn such materials in small heaps or piles when the fire is set in a public road, garden or plowed field



Grain valued at \$150,000 burned in storage after being saved from fire in the field.

at a distance of not less than two hundred feet from any woodland, brushland or field containing dry grass or other inflammable material.

SEC. 2. To carry out the purposes of this ordinance the county firewarden and each state firewarden residing within the county is empowered to issue permits to burn, each of which shall contain such safeguarding restrictions as to time of burning and precautions to be taken as reasonably may be necessary to prevent the fire from endangering the lives or property of others. No permit shall relieve or exonerate any person from civil or criminal liability in case by reason of any such fire, injury results to person or property. Each warden shall have the power to refuse, revoke or postpone permits when necessary for the protection of life or property.

SEC. 3. It shall be unlawful to burn any pit of charcoal without keeping and maintaining a careful and competent watchman in charge of said pit while burning.

SEC. 4. Any person, firm or corporation that violates any of the provisions hereof is guilty of a misdemeanor and upon conviction shall be punished by a fine of not less than fifty dollars nor more than five hundred dollars, or by imprisonment in the county jail for not less than fifteen days nor more than six months, or by both such fine and imprisonment.

Plow furrows and cut hay strips around grain fields.

The plowing of furrows and cutting of hay strips around grain fields are precautionary measures that pay. Aside from the fires that may start along the roadside, there is always danger of fires from neighboring fields. Many grain fields were destroyed this summer because of their exposure to fire due to the neglect of their owners to safeguard them either by clearing the adjoining roads, or making firebreaks within the fields.

Most grain producing counties have an ordinance requiring this form of fire protection. The following section from the Stanislaus County ordinance is representative:

SECTION 1. Every person, firm, corporation, co-partnership, district or association of persons whatsoever, being in possession of, or occupying, or having control of any land within the county of Stanislaus, outside of incorporated cities and towns, upon which there has been sown, or is standing, growing, or grown, any wheat, oats, barley, hay, or other vegetation of any kind whatsoever, which when so sown, standing, growing, grown, or being upon said land in any way has become inflammable and in such a condition as to be easily set on fire, at all times during the season when the said wheat, oats, barley, hay or other vegetation is inflammable and in such a condition as to be easily set on fire, shall maintain on every portion of the boundary of the said land where the said land adjoins other land upon which said other land there is standing, growing, or being any wheat, oats, barley, hay or other vegetation of any kind which is inflammable and in such a condition as to be easily burned, an effective fire protection or fire break, the said fire protection or fire break to be made by plowing along the said boundary a strip of the said land not less than three feet in width, or by the removal of all inflammable matter from a strip of the said land not less than six feet in width along the said boundary when the said fire protection or fire break is made in some other manner than by plowing; *provided*, that when the said land adjoins a highway the fire break may be made by removing all inflammable matter from the half of the highway next to the said land.

Records of the causes of grain fires the past year show that nearly 50 per cent were caused by harvesting machinery. Sparks may come from hot carbon from the exhausts, hot boxes, ignition of chaff in contact with exhaust pipes and manifolds, or by foreign matter such as gravel getting into the separator.

Many of the fires set by sparks from harvesting machinery are the result of carelessness. Ordinances were passed by a number of counties requiring the use of effective spark-arresters, and the last legislature amended the section in the Penal Code, regarding prevention of fires, by inserting the following clause:

384. Any person who shall wilfully or negligently commit any of the acts hereinafter enumerated in this section shall be guilty of a misdemeanor, and upon conviction thereof be punishable by a fine of not less than fifty nor more than five hundred dollars, or imprisonment in the county jail not less than fifteen days nor more than six months, or both such fine and imprisonment.

* * * * *

4b. Operating or causing to be operated any gas tractor, oil-burning engine, gas-propelled harvesting machine or auto truck in harvesting or moving grain or hay, or moving said tractor, engine, machine or auto truck in or near any grain or grass lands, unless he shall maintain attached to the exhaust on said gas tractor, oil-burning engine or gas-propelled harvesting machine an effective spark-arresting and burning carbon-arresting device.

HOW TO CONTROL GRAIN FIELD FIRES.

Nip them in the bud with fire-extinguishers.

The efficiency of fire-extinguishers in combatting grain fires has been demonstrated beyond a doubt. They offer the best means of extinguishing fires in their incipency, and will check them even after they have attained a considerable start.

The fire law of California now directs that fire-extinguishers shall be kept in readiness on harvesting and hay-baling outfits. The section of the Penal Code dealing with this matter is as follows:

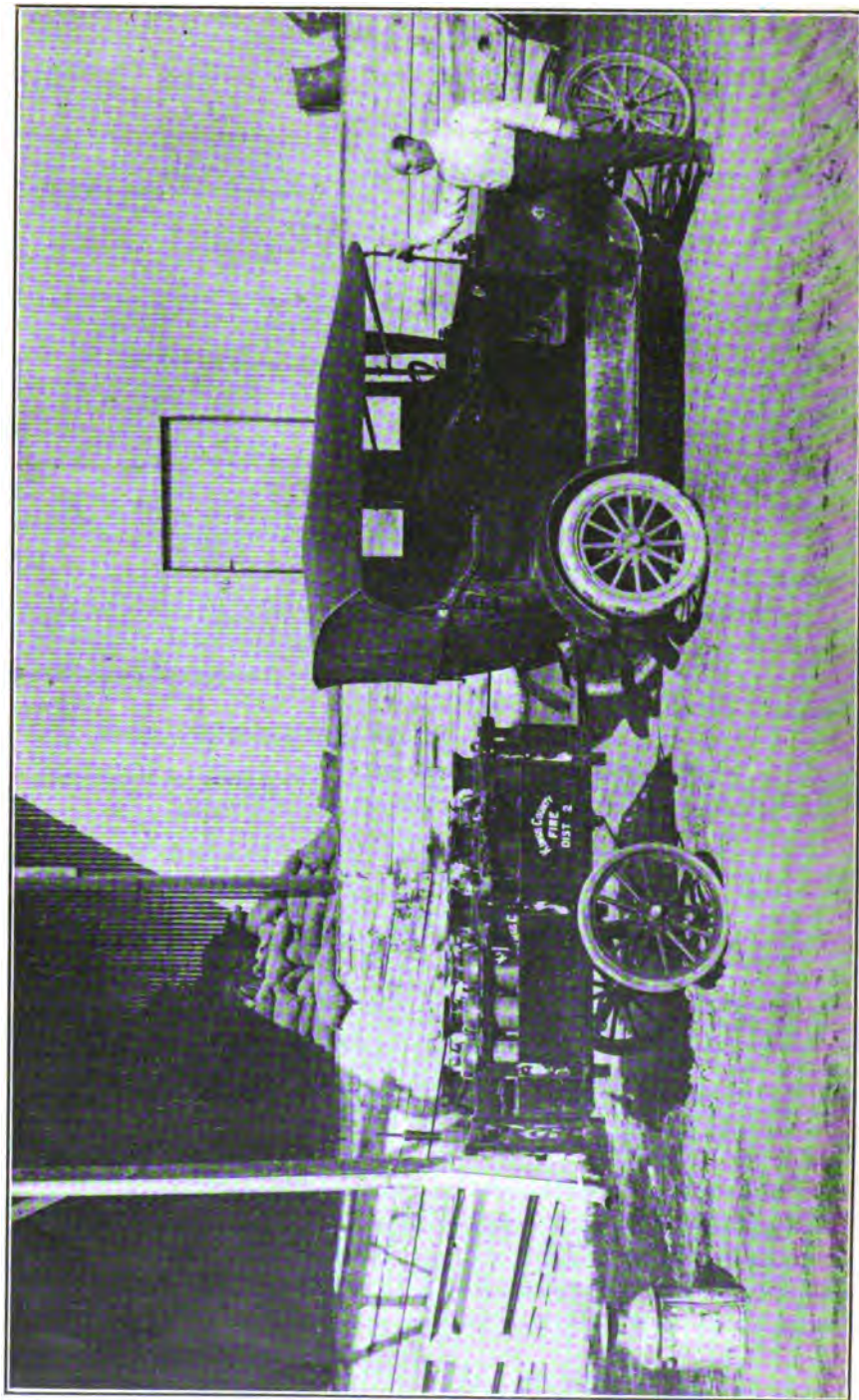
384. Any person who shall wilfully or negligently commit any of the acts hereinafter enumerated in this section shall be guilty of a misdemeanor, and upon conviction thereof be punishable by a fine of not less than fifty nor more than five hundred dollars, or imprisonment in the county jail not less than fifteen days nor more than six months, or both such fine and imprisonment.

* * * * *

4a. Harvesting grain or causing grain to be harvested by means of a combined harvester, header, or stationary threshing machine, or baling hay by means of a hay press, unless he shall keep at all times in convenient places upon each said combined harvester, header, or stationary threshing machine, or hay press, fully equipped and ready for immediate use, two suitable chemical fire extinguishers, approved by the underwriters' laboratories, each of the capacity of not less than two and one-half gallons.

Strengthen rural fire organizations.

The efficiency of rural fire protection in most of the grain sections of California rests on the activity of the rural fire companies. If these companies are not well organized, and do not have sufficient and proper equipment, they will fall down in their work.



A trailer outfit ready to go

Equipment such as fire extinguishers, shovels and trailers can usually be secured through the county board of supervisors if the need for it is sufficiently urged. Funds necessary for its purchase can be taken from the general fund of the county. Authority for an appropriation by a county for fire protection is contained in the Political Code, section 4041, subsection 40, which authorizes supervisors—

To appropriate a sum not exceeding two cents per one hundred dollars of the assessed valuation of their county in any one year, in addition to any sum which may be chargeable to the county for the repayment of money expended by the state for protection against fire in such county, for the purpose of protecting forest, brush and grass lands therein, against fire or other injury, and of aiding the state and federal authorities in forestry work.

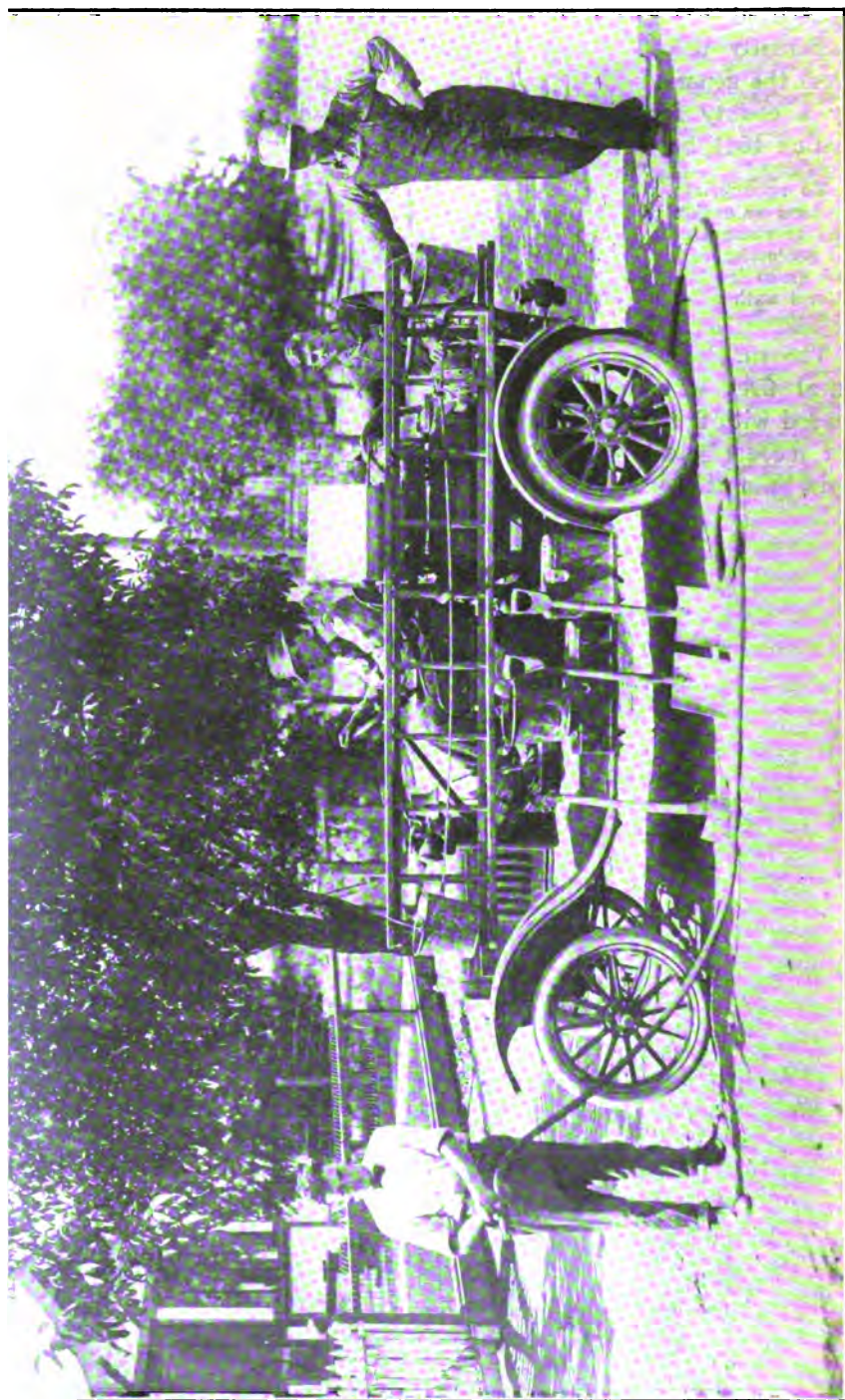
The time is rapidly approaching in this state when all classes of rural fires will be handled by motorized apparatus. The trailers loaded with fire-extinguishers and other equipment have paved the way for more efficient means for handling rural fires. Last summer the light auto fire equipment of Arbuckle, Brentwood and other towns gave valiant service in controlling fires in the surrounding country.

If the small town and the rural districts will unite in the purchase of light auto equipment combining a chemical and pumping engine and hose wagon, the benefit will be mutual and the cost very reasonable to all concerned. The rural population can thus be reasonably sure that a telephone call will find the town fire department equipped and ready to serve them promptly.

Successful fire-fighting depends on getting to the fire in the shortest possible time with effective fire-fighting equipment. The first few minutes is the critical time which decides the amount of loss. Simple motor apparatus, which can be operated on short notice, enables the town fire department to get to rural fires quickly and do effective fighting when it arrives.

Cooperation can usually be effected by calling a meeting of the people of the town and those in a designated territory, and by making provision that certain portions of the expense of maintenance of apparatus will be borne by those who desire protection. This has been done in a few instances with marked results.

When motorized apparatus has been used, it is the general rule that it is at the fire considerably in advance of the trailer outfit in the immediate vicinity. Furthermore, it can handle a much more severe fire than the trailer outfit. A grain fire was fought last summer by a light auto outfit and was extinguished only after five thirty-gallon chemical charges had been used. Such a fire could not be handled by ordinary means. The only recourse would have been to back-fire, which would have burned over a large area. The motor outfit paid for



A light auto outfit that saved standing grain worth many thousands of dollars.

itself on this one fire, and saved grain valued at \$150,000 during the course of the summer.

Rural fire organizations can depend upon the cooperation of the State Board of Forestry in their efforts to prevent and control fires.

CAUSES OF GRAIN FIRES.

The causes of the grain fires in 1916, 1917 and 1918 are those reported by the National Board of Fire Underwriters. The causes of the fires that took place in 1919 are taken from reports furnished the State Board of Forestry by eighteen fire insurance companies in California, county farm agents, state firewardens and farmers.

Cause	1916	1917	1918	1919
Exposure	94	30	48	19
Sparks from machinery.....	17	30	123	87
Incendiarism	10	3		5
Lightning	1	1	3	
Smoking	43	19	19	27
Open lights	1			
Petroleum	9	12	3	
Burning rubbish	2			10
Sparks from exhausts.....	67	28	19	20
Miscellaneous	9	9	15	9
Unknown	54	43	46	44
Total fires	307	175	276	221

CAUSES OF PASTURE AND STACKED HAY FIRES.

Cause	1916	1917	1918	1919
Exposure	52	30	11	15
Sparks from machinery.....		3	5	12
Incendiarism	15	3	3	5
Lightning			2	
Smoking	19	9	8	18
Open lights	1			
Petroleum			1	
Burning rubbish				7
Sparks from exhausts.....	6	5	3	2
Miscellaneous		7	3	10
Unknown	48	45	57	38
Spontaneous combustion				7
Total fires	141	102	93	114

A study of the above figures for the past four years shows that fires from exposure, which is the insurance term for fires that start outside the field insured or are communicated from a barn or other occupancy

to a stack of hay, reported upon, are decreasing. This is probably due to increased carefulness in burning grass and stubble, and to the system of permits that prevails in several counties where exposure fires were common. It also shows that rural fire organizations have been efficient in preventing the spread of fires, a large percentage of exposure fires spread from railroad rights of way either from careless burning by section crews or from fires started in the dry grass where no burning had been done. Burning tobacco thrown from passing automobiles in the dry grass along the highways was responsible for many of the fires classified under smoking.

The outstanding fact shown by the above tables of causes is the increasing number of fires caused by sparks from machinery, and by the exhausts of tractors and trucks. It is probable that many of the unknown fires are due to these causes. This points to increased vigilance in equipping harvesting machinery with efficient spark-arresters, and the thorough overhauling of machinery before the harvest season.

Spontaneous combustion is responsible for a number of stacked hay fires. Professor John W. Gilmore, College of Agriculture, University of California, makes the following comments on causes and remedies of hay fires caused by spontaneous combustion:

So far as I know spontaneous combustion has not taken place except in stacks or mows of alfalfa hay. The facts which I have all pertain to this type of hay. It may be that some fires have taken place in stacks of grain hay, but I have not heard of them.

All of the proteinaceous hays, that is, alfalfa, clover, pea vine, and other legumes, are subject to spontaneous combustion when stored in considerable quantity with moisture content above a certain percentage, depending upon quality of the hay and air supply. Usually moisture content above 15 per cent is dangerous.

The first process in the causes leading up to spontaneous combustion is that of rapid fermentation, owing to the per cent of moisture and the highly fermentable proteins of the hay. This fermentation is accompanied of course by heat which usually reaches a temperature of about 135 degrees Fahrenheit. At that temperature oxidation begins more or less rapidly according to the supply of fresh air which may be in the environment of the wet spots in the stack. This oxidation seems to affect the carbohydrates of the hay first and the decomposition products are moisture and carbon dioxide. The moisture condenses on the surrounding hay, and consequently increases the volume of hay under fermentation and oxidation, and meanwhile the oxidation increases more and more rapidly until finally the bulk of hay is either charred where sufficient air is not available, or it bursts into spontaneous flame where ventilation is suitable. So far as I know, there is no adequate remedy against spontaneous combustion after the hay has been put in the stack under circumstances of its containing too much moisture in any part or in the whole. The remedy against this risk is to thoroughly cure the hay before stacking it. Even if ventilators are distributed through the stack or mow where the hay is too moist, these may only serve to augment the trouble, since after oxidation has begun these ventilators may bring to the oxidizing mass fresh air and thus cause the generation of flame even more readily than if ventilation were thoroughly cut off. Under circumstances of high moisture content in the hay and no ventilation whatever, the stack or mow usually becomes a charred mass.

Theoretically, the remedy against spontaneous combustion would be to treat the hay in some way that would prevent oxidation, or even fermentation, under circumstances of stacking, but I am not aware of any treatment that would be feasible to prevent either of these two processes and at the same time maintain the hay in a

palatable and digestible condition. I believe, therefore, that in order to reduce this risk we must set forth by lecture, the printed page, and every other possible means the importance of thoroughly curing the hay before it is stacked or mowed.

PERIOD OF GRAIN, HAY AND PASTURE FIRES, 1919.

	Per cent
May	7.7
June	45.8
July	28.7
August	8.9
September	3.9
All other months	5.0

GRAIN, HAY AND PASTURE LOSSES.

Reported by National Board of Fire Underwriters.

Year	Grain growing in fields	Hay and grain in stacks
1916	\$221,095	\$61,247
1917	248,601	60,689
1918	185,994	83,801

Reports Received by State Board of Forestry.

Year	Grain and pasture	Improvements	Hay and grain in stacks
1919	\$332,047	*\$42,467	\$46,450

*Fencing, buildings, harvesters and hay presses destroyed by grain, pasture and hay fires.

